

III. MISSOURI'S NONPOINT SOURCE MANAGEMENT PLAN

NPSMP GOALS AND OBJECTIVES

EXCERPTED STRATEGIC PLANS OF NPS PARTNER AGENCIES

NONPOINT SOURCE MANAGEMENT PLAN (NPSMP)

The Missouri Nonpoint Source Management Plan is, by definition, a plan for the state. As such, it requires the cooperation and coordination of all partners addressing NPS issues in order for it to be successful. The Missouri Department of Natural Resources (DNR) is the designated state water quality agency and, therefore, is responsible for taking the lead on the NPSMP. This plan, however, is written with the help and input from all the partners who share in the responsibility for managing nonpoint sources (Appendix B). As a state plan, it contains some elements beyond the purview and legal authority of the DNR (Appendix C) but other partners address those elements. This section of the NPSMP is structured to help readers understand where the partners overlap and differ in their strategic plans but as a whole achieve the goal of the NPSMP. Following the goals, objectives, and strategies of the NPSMP, excerpts from the strategic plans of the partners have been provided with reference made to where they meet or enhance specific objectives or strategies of the NPSMP (*NPSMP Objectives/Strategies X.x.x*). The excerpts have been typed verbatim. If you have questions or comments regarding any of the strategic plan excerpts, please contact the agency responsible for that plan.

NPSMP GOALS, OBJECTIVES AND STRATEGIES

The NPSMP is a five-year plan. The broad goals described below are intended to identify the general activities necessary to achieve the stated mission. The objectives reflect the five-year life of the plan, with most of them being targeted for completion in five years or less. At that time, the mission, goals and objectives will be reevaluated to determine if the objectives were achieved, if the objectives were appropriate for reaching the goals and if the goals are appropriate for achieving the mission.

Mission *Preserve and protect the quality of the water resources of the state from nonpoint source impairments.*

Goal A: Water Quality Assessment, Monitoring and Prioritization

For at least the next five years, continue and enhance statewide water quality assessment processes to evaluate water quality and prioritize watersheds affected by NPS pollution.

Goal A: Objectives

1. Periodically assess and prioritize watersheds in need of restoration due to NPS pollution based on available methodologies.
2. Continue to improve water quality monitoring methods used to assess NPS pollution.
3. By 2001, develop and propose to the Clean Water Commission numeric biological criteria, as a water quality standard, to better identify those impacted wadable streams incapable of supporting the expected biological community.
4. Publish a report of water quality assessment efforts using improved methodologies by 2005.
5. Coordinate with USEPA to develop nutrient criteria and propose those criteria as water quality standards by 2003.

Goal A: Implementation Strategies

- a. Coordinate with NPS partners to develop biocriteria and nutrient criteria.
- b. Continue statewide monitoring of aquatic fauna and flora.
- c. Conduct special studies of habitat and fish communities.
- d. Conduct fish tissue sampling.
- e. Collect, manage and disseminate quality-assured water quality data.
- f. Support training of volunteers.
- g. Continue monitoring on the Missouri and Mississippi Rivers.
- h. Review available data and watershed priorities.
- i. Review existing water quality standards every 3 years.
- j. Develop a watershed prioritization tool useful at the 14 digit HUC level of detail.
- k. Continue to develop aquatic macroinvertebrate biocriteria.
- l. Maintain the level of effort and cooperation achieved for water quality monitoring and water quality data management at or above FY 2000 levels.
- m. Participate in USEPA Region 7 nutrient criteria workgroup.
- n. By 2004, complete at least 20 TMDL studies.
- o. Facilitate the development and use of watershed water quality modeling of NPS pollutants such as contaminated sediments, suspended sediment, pesticides and nutrients.
- p. Integrate karst protection strategies to monitor nonpoint source contributions to water degradation.

Goal A: Evaluation Measures

- a. Production of 303(d) list, 305(b) report and updated Unified Watershed Assessment.
- b. Establishment of biological and nutrient criteria as water quality standards.
- c. Number of TMDL studies completed.
- d. Number of watersheds with ambient monitoring.
- e. Number of watersheds with biological and habitat assessment.
- f. Number of ambient monitoring sites by ecoregion.
- g. Number of sites with biological and habitat assessment by ecoregion.
- h. Number of watersheds with ambient, biological, and habitat assessments.
- i. Number of watershed water quality models of NPS pollutants developed.

Goal B: Water Quality Improvement and Protection

Improve water quality by implementing NPS-related projects and other activities.

Goal B: Objectives

1. By 2004, 25% of waters listed on the 1998 303(d) list due to NPS pollution will meet water quality standards.
2. By 2014, 75% of waters listed on the 1998 303(d) list due to NPS pollution will meet water quality standards.
3. Reduce potential nonpoint sources of groundwater contamination.
4. Cooperate and collaborate with other resource programs, agencies and private partners to prevent, manage, and reduce nonpoint sources of pollution.
5. Encourage environmental stewardship through information and education.

6. By December 2004, initiate 20 or more locally led watershed projects incorporating water quality protection, restoration, or voluntary TMDL action plans.
7. By 2009, begin implementing at least 20 locally led voluntary TMDL action plans.
8. Support pollution prevention efforts to sustain water quality of outstanding state or national resource waters. (See list in Appendix G)
9. Support pollution prevention efforts to sustain water quality of those waters that are close to meeting the criteria for being placed on the 303(d) list as impacted by NPS pollutants, but have not yet attained that status. (See Section IV, Priority Waters, Paragraph 3)

Goal B: Implementation Strategies

- a. Expand eligible uses of the State Revolving Loan fund programs to include prevention or control of nonpoint sources.
- b. Designate as top priority for funding assistance those waters included on the 303(d) list as impaired by nonpoint sources.
- c. Support programs and training that provide communities and local leaders the tools to plan, fund and direct watershed protection and restoration efforts.
- d. Encourage and support locally led watershed projects that incorporate water quality protection, restoration, or voluntary TMDL action plans.
- e. Direct funding pursuant to section 319 of the Clean Water Act with maximum flexibility to complement resources available to the watershed from other programs and agencies.
- f. Support development and adoption of innovative best management practices through resource management systems.
- g. Sponsor water quality information and education programs and materials.
- h. Offer technical assistance and cost share assistance as appropriate.
- i. Support water quality, NPS issues training and technical certification processes for advisors to the public in related resource areas.
- j. Support activities promoting environmental stewardship in the manipulation of land by the developmental, agricultural and silvicultural communities.
- k. Actively seek collaborative NPS water quality protection projects that are likely to provide mutual benefits to participants and sponsors.
- l. After revision of the Unified Watershed Assessment to make it a more usable tool, target Category I watersheds for voluntary TMDL action plans or WQMP plan implementation.
- m. Advise local entities on the appropriate use of urban and suburban stream protection and stormwater sediment control resolutions and ordinances.
- n. Promote pollution prevention and protection of waters in projects throughout the state.
- o. By 2004, integrate NPSMP goals and objectives into Phase II of the State Water Plan.
- p. Develop watershed restoration and protection strategies for priority areas where water quality is degraded by nonpoint source pollution due to karst topography.

Goal B: Evaluation Measures

- a. Number of local or regional watershed alliances formed.
- b. Number of Special Area Land Treatment (SALT) agricultural NPS water quality projects approved by the Soil and Water Commission.
- c. Number of acres treated and best management practices applied as part of watershed projects and voluntary WQMP/TMDL action plans.
- d. Number of watershed projects initiated and voluntary TMDL action plans implemented.
- e. Number of locally led watershed projects initiated and locally led voluntary TMDL action plans implemented.
- f. Number of drinking water reservoirs in compliance with NPS-related drinking water standard.
- g. Quantifiable measures on a project-specific basis such as: tons of soil saved, reductions in nutrients and pesticides applied (if appropriate), reductions in pesticides and nutrients leaving the field.
- h. Number of nutrient management plans (NMP) implemented at animal feeding operations (AFOs).
- i. Number of acres on which nutrients are applied in accordance with an approved NMP.
- j. Number or amount of State Revolving Fund loans used to prevent NPS pollution.
- k. Number of stream miles and lake acres returned to compliance with water quality standards which were included on the 1998 list of impaired waters prepared under Section 303(d) of the federal Clean Water Act as a result of NPS pollution.
- l. Number of potential nonpoint sources of groundwater contamination controlled.
- m. Number of educational and informational activities conducted by government and private entities.
- n. Number of participants in educational and informational activities.
- o. Number of informational and guidance materials developed and distributed.
- p. Number of stream teams and Level I, II, and III volunteer monitoring teams.
- q. Number of abandoned wells certified as properly plugged.
- r. Number of source water protection plans.
- s. Number of acres protected by source water protection plans.

Goal C: State NPS Program Management

Maintain a viable, relevant, and effective NPS Management Program with the flexibility necessary to meet changing environmental conditions and regulations.

Goal C: Objectives

1. Review and update the NPS Management Plan (NPSMP) every five years.
2. Strengthen cooperation and collaboration with other resource programs, agencies and private partners.
3. Use appropriate program and financial systems to ensure Section 319 funds are used consistently with legal obligations and environmental benefits are maximized.
4. By 2004 identify federal lands and activities that are not managed consistently with state NPS objectives (see Appendix D).
5. Maintain funding of NPS activities at or above 1999 levels.

Goal C: Implementation Strategies

- a. Organize and support meetings that provide a forum for sharing water quality and NPS information and technologies, such as the Water Quality Coordinating Committee, Watershed Committee of the Ozarks and others.
- b. Work with local authorities and landowners to achieve goals in the state NPSMP.
- c. Capitalize on opportunities to provide input regarding NPS issues to other entities.
- d. Incorporate NPS-related goals of other groups and agencies in the NPS Management Program as appropriate and provide complementary assistance in achieving those goals.
- e. Review and revise the NPSMP according to the following schedule:
 - Annually review and, if appropriate, revise the assessment and monitoring strategy and funding sources in the NPSMP.
 - Year two, review and update the implementation assistance and regulatory authorities.
 - Year three, review and update remaining categorical sections such as land application of permitted wastes.
 - Year four, review and revise goals and objectives and review legal certification of authority. Complete updates of any sections not revised during the preceding five years.
 - Make appropriate revisions to the NPSMP as needed when changes in environmental conditions or regulatory authorities make the existing plan irrelevant or inappropriate.
- f. Use the Water Quality Coordinating Committee and other forums to review, comment, and participate in the NPSMP review and revision.
- g. Use the Clean Water Commission and public notice procedures to provide the opportunity for public review and comments to the revised NPSMP.
- h. Maintain current information on Grant Reporting and Tracking System (GRTS).
- i. Periodic audits conducted.
- j. Follow EPA guidelines in reviewing, prioritizing, funding and managing activities funded under section 319 of the Clean Water Act.
- k. Suggest improvements to state and federal program guidelines when appropriate to enhance NPS management capabilities.

Goal C: Evaluation Measures

- a. NPSMP is reviewed and updated in accordance with preceding schedule.
- b. Numbers and diversity of participants involved in the Water Quality Coordinating Committee meetings.
- c. Number and diversity of collaborators in development of NPSMP.
- d. Number of federal lands or activities inconsistent with the NPSMP and the number of those lands or activities addressed.
- e. Status of GRTS reporting.
- f. Number of projects closed out properly.
- g. Number of MOA's signed between or among partnering entities.
- h. Procedural improvements identified and implemented.
- i. Amount of state funding directed to NPS activities.
- j. Amount of federal funding directed to NPS activities in Missouri.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Strategic Plan (Excerpts)

Mission

Preserve and protect the state's natural, cultural and energy resources and inspire their enjoyment and responsible use for present and future generations.

Strategic Issue 1: Protecting Missouri's Water, Air and Land Resources

GOAL: WATER

Continuously preserve and protect the quality and quantity of the water resources of the state of Missouri.

Outcome A

Improved quality of surface water and groundwater in the state.

Outcome Measures

1. Increase in the number of stream miles and lake acres that are safe and useable for drinking, swimming, fishing and watering livestock
2. Reduction in the number of sites where groundwater aquifers are contaminated above drinking water standards

Objective 1

By 2003, increase compliance with minimum water quality standards on: six stream miles currently polluted by animal manure; two stream miles currently polluted by abandoned mine lands; 10 stream miles currently polluted by domestic point source discharges; and 50 lake acres currently polluted by farm herbicides.

Objective Measures

1. Number of stream miles returned to compliance with water quality standards which were included on the 1998 list of impaired waters prepared under Section 303(d) of the federal Clean Water Act as a result of discharges of animal manure, abandoned mine lands, and domestic point source discharges
2. Number of lake acres returned to compliance with water quality standards that were included on the 1998 list of impaired waters prepared under Section 303(d) of the federal Clean Water Act as a result of farm herbicides
3. Compliance with Underground Injection Control and Oil and Gas Council regulations
4. Number of stream miles failing to meet water quality standards due to sedimentation

Strategies

- a. Perform Total Maximum Daily Load studies to identify pollution sources and allocate pollution loads. (*NPSMP Goals/Objectives/Strategies A.n.*)
- b. Perform special water quality studies to assess source impacts and better understand the interaction of pollutants and the aquatic environment. (*NPSMP Goals/Objectives/Strategies A.b.c.d.*)
- c. Develop and propose to the Clean Water Commission numeric biological criteria as a water quality standard in order to identify better those impacted streams incapable of supporting the expected biological community. (*NPSMP Goals/Objectives/Strategies A.3.a.*)
- d. Complete revision of the nonpoint source management plan. (*NPSMP Goals/Objectives/Strategies C.1.e.*)
- e. Ensure that Missouri water quality meets standards and laws, through permitting, inspection and enforcement efforts. When necessary and appropriate for protection of our natural resources, promulgate new rules.
- f. Issue Letters of Approval to guide small animal production operations in best management practices. (*NPSMP Goals/Objectives/Strategies B.4.f.*)
- g. Remediate abandoned coal mine lands to reduce water quality impacts from salts and acid-forming materials. (*NPSMP Goals/Objectives/Strategies B.1.b.*)
- h. Require remediation of abandoned metallic mineral mine lands to reduce water-quality impacts from metals and particulates. (*NPSMP Goals/Objectives/Strategies B.1.b.*)
- i. Support multi-agency efforts to encourage application of Best Management Practices in the watersheds of drinking water lakes impacted by farm herbicides. (*NPSMP Goals/Objectives/Strategies B.3.f.k.*)
- j. Through the Special Area Land Treatment program for watersheds, work with landowners to apply best management practices and establish agricultural NPS projects. (*NPSMP Goals/Objectives/Strategies B.3.e.f.*)
- k. Maintain interagency coordination and cooperation through the Water Quality Coordinating Committee and participation in other forums. (*NPSMP Goals/Objectives/Strategies C.2.a.*)
- l. Issue grants and low-interest loans to assist in the construction of domestic wastewater and animal waste facilities. (*NPSMP Goals/Objectives/Strategies B.3.a.*)
- m. Issue stormwater grants and grants to assist with NPS information, education and demonstration activities. (*NPSMP Goals/Objectives/Strategies B.4.c.g.j.*)
- n. Monitor compliance with the Underground Injection Control, and Oil and Gas Council regulations to ensure both optimal resource recovery and environmental protection.

Objective 2

Increase compliance with groundwater protection regulations.

Objective Measures

1. Percent of properly abandoned oil and gas wells
2. Percent increase in water wells constructed according to water well regulations and requirements
3. Geologic site evaluations conducted for solid waste disposal, hazardous waste disposal, subdivision waste disposal and potential wastewater lagoons

Strategies

- a. Enforce the upgrade requirements for underground storage tanks. (*NPSMP Goals/Objectives/Strategies B.2.*)
- b. Require remediation of soil and groundwater contamination by leaking underground storage tanks and hazardous substances. (*NPSMP Goals/Objectives/Strategies B.2.*)
- c. Enforce regulations that protect Missouri's groundwater resource including well driller and pump installation, oil and gas regulations, the Clean Water Law and the Cave Resources Act. (*NPSMP Goals/Objectives/Strategies B.2.*)
- d. Ensure that facilities are constructed in a manner protective of groundwater resources through evaluation of potential sites for geologic and hydrologic considerations. (*NPSMP Goals/Objectives/Strategies B.2.*)
- e. Research and develop a plan for measuring groundwater quality effectively and efficiently throughout Missouri. (*NPSMP Goals/Objectives/Strategies A.2.*)

Objective 3

Increase in the availability, accuracy and understanding of geologic, hydrologic and water use data as it relates to water resources.

Objective Measures

1. Amount of geologic, hydrologic and water use data produced or reported:
 - a. Flood studies
 - b. Surface, groundwater and spring studies
 - c. Watershed modeling studies
 - d. Major water users registration
 - e. Well logs
 - f. Missouri and Mississippi River data
2. Number of water related databases available through a Geographic Information System (GIS)
3. Decrease in percent of error in data retrieval from monitoring equipment
4. Improve tracking of groundwater quality by increasing the number of monitoring wells statewide

Strategies

- a. Conduct an analysis of future water demand and water needs on an annual basis.
- b. Collect, manage and distribute accurate data regarding the surface and subsurface water of the state and its use. To develop this information, maintain integrated major water user and other technical water resources databases and prepare river basin and watershed physical information reports. (*NPSMP*)

Goals/Objectives/Strategies A.1,2.e.)

- c. Participate in flood restudy efforts of the Missouri and Mississippi rivers to determine 100-year and other flood stage height changes.
- d. Increase surface and groundwater studies describing discharge and recharge areas.
- e. Continually examine water laws for changes in legislation and registration needs.
- f. Improve monitoring equipment and the retrieval of accurate data from the equipment. (*NPSMP Goals/Objectives/Strategies A.2.e.)*
- g. Gather more frequent information from the United States Corps of Engineers and from other states on potential projects that may affect Missouri's water flows.

Outcome C

Drinking water meets all health-related standards

Outcome Measures

1. Increased percentage of Missourians living where drinking water meets government standards (Show-Me Result)
2. Reduction in the contaminant levels in source water

Objective 1

Improve the quality of public drinking water by decreasing the number of significant non-compliers each year.

Objective Measures

1. Increase in the number of public water systems that are sampled on a regular basis and the number of bacterial, chemical and radiological samples analyzed
2. Increase in the number of public drinking water systems that are inventoried
3. Decrease in the number of incidents of waterborne diseases
4. Decrease in the percentage of public water systems with acute violations
5. Decrease in the number of public water systems forced to use alternate or emergency sources of drinking water not identified in standard or emergency operating procedures
6. Decrease in the number of public water systems having to implement extreme water conservation measures

Strategies

- a. Maintain a contaminant monitoring program for public water systems in accordance with the Safe Drinking Water Act. (*NPSMP Goals/Objectives/Strategies A.2.e.)*
- b. Provide operator training and technical assistance for public water systems. (*NPSMP Goals/Objectives/Strategies B.3.i.)*
- c. Provide funding for public water system improvements through grants and loans.
- d. Assure adequate construction of drinking water facilities through plan and other engineering reviews, and permitting and construction inspections.
- e. Help public water systems protect their source water quality through source water protection programs. (*NPSMP Goals/Objectives/Strategies B.3.c.e.)*

- f. Cooperate with state and federal agencies to support NPS pollution control and other source water protection efforts. (*NPSMP Goals/Objectives/Strategies B.3.*)
- g. Ensure that public drinking water systems in Missouri are properly managed through permitting, inspection and enforcement efforts. Promulgate understandable, reasonable and workable drinking water rules through the Safe Drinking Water Commission.
- h. Promote system consolidation, wholesale water distributors and other mechanisms to provide public water systems with adequate water supplies.
- i. Ensure that source issues are adequately addressed in public water systems emergency operating plans.

Objective 2

Improve the quality of drinking water supplies by increasing compliance with the Water Well Drillers Act.

Objective Measures

- 1. Percentage of water wells submitted for review that are certified
- 2. Number of water well drillers and pump installers registered

Strategies

- a. Ensure compliance with Water Well Drillers Act.
- b. Provide training sessions for all drillers and pump installers so that wells are properly constructed and groundwater protection measures installed. (*NPSMP Goals/Objectives/Strategies B.2.i.*)
- c. Work with financial institutions to ensure that water wells are certified before any transactions dealing with the sale of land are completed.

Outcome D

Protection of the state's wetland resources

Outcome Measure

Trends in wetland acreage

Objective 1

Effect no net loss of wetland acreage

Objective Measure

- 1. Number of wetland studies completed and reports issued

Strategies

- a. Evaluate wetland health by investigating surface water and groundwater levels, soils saturation, soil characterization, soil evaluations, and by the use of satellite and aerial photography to evaluate changes in wetland acreage. (*NPSMP Goals/Objectives/Strategies A.2.b.*)
- b. Increase educational activities regarding wetlands. (*NPSMP Goals/Objectives/Strategies B.4.g.*)

- c. Require mitigation for wetland losses through the water quality certification process.
- d. Provide protection of wetlands through purchase of wetland acreage when effective and appropriate for inclusion in the state park system.

GOAL: LAND

Preserve and protect Missouri's land resources for ongoing responsible use.

Outcome E

Reduction in soil erosion on Missouri's agricultural land

Outcome Measure

Increased productivity of Missouri's firms and farms (Show-Me Result) as measured by tons of soil saved

Objective 1

By 2006, reduce soil erosion on 95 percent of Missouri agricultural land to a level at which soil loss does not hinder productivity (i.e. it is tolerable).

Objective Measures

- 1. Increase in the miles and acres of soil conservation practices constructed
- 2. Maintain or increase in the number of educational events held by soil and water conservation districts
- 3. Increase in the number of watersheds with soil conservation practices constructed
- 4. Increase in the Special Area Land Treatment projects completed utilizing soil conservation treatments

Strategies

- a. Create partnerships with agencies involved in soil conservation. (*NPSMP Goals/Objectives/Strategies C.2.a., B.3.*)
- b. Expand the department's role in providing technical assistance for soil conservation, and promote land use practices that maximize soil protection. (*NPSMP Goals/Objectives/Strategies B.3.f.h.j.*)
- c. Collect and manage data related to soil conservation efforts so that a central source of information is available to all interested parties.
- d. Provide training for Soil and Water Conservation District supervisors and employees to maximize conservation efforts and improve fiscal responsibility for the Soils Sales Tax Fund. (*NPSMP Goals/Objectives/Strategies B.3.i.*)
- e. Improve fiscal and operational accountability through enhancement of the Soil and Water Conservation District and cost-share accounting system and continuation of audits for the districts.
- f. Begin implementation of the initiative to address the water quality issues in the Table Rock Lake watershed resulting from soil erosion and runoff. (*NPSMP Goals/Objectives/Strategies B.5.*)

- g. Continue to provide various types of financial assistance to construct and implement soil conservation measures including grants and loans. (*NPSMP Goals/Objectives/Strategies C.5.*)

MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES
Section for Environmental Public Health

Strategic Plan
(Excerpts)

Issue: The lack of a clear legal authority has caused a fragmented public health system within Missouri.

Objective 3

To reduce the public health impact of potentially unsafe private water supplies by developing and implementing a private water supply program by July 2005.

Strategies

1. Develop and implement standards and policies for private water supplies.
2. Establish and enhance a database of existing private water supplies in Missouri.
3. Develop relationships with other interested agencies in promoting the protection of private water supplies. (*NPSMP Goals/Objectives/Strategies B.3.*)
4. Evaluate literature to determine the risk associated with recreational water.
5. Develop educational tools for groundwater safety (brochures, PSA, presentations). (*NPSMP Goals/Objectives/Strategies B.2,4.g.*)
6. Develop a list of financial resources for improvement of private water supplies.
7. Develop a unified set of standards for private water supplies with other interested agencies.
8. Develop training programs for inspectors, financing agents and other interested parties. (*NPSMP Goals/Objectives/Strategies B.4.i.*)
9. Work with SPHL to utilize the most efficient analysis of private water samples.

Objective 4

To increase the surveillance of recreational water to determine the risk to public health and safety by July 2003.

Strategies

1. Develop and implement a study to determine the public health risk associated with recreational water. (*NPSMP Goals/Objectives/Strategies A.2.*)
2. Evaluate health databases to determine risks potentially associated with recreational water.
3. Develop an assessment tool to survey the counties to determine their risks associated with recreational water.
4. Evaluate literature to determine the risks associated with recreational water.
5. Establish statutory authority for the program.
6. Establish standards for safe recreational water. (*NPSMP Goals/Objectives/Strategies A.i.*)
7. Develop model ordinances.
8. Develop and implement rules.
9. Develop tools to educate on what is safe recreational water. (*NPSMP*

Goals/Objectives/Strategies B.4.g.)

Issue: All of Missouri's 5.2 million citizens and 35 million visitors are potentially exposed to hazardous substances and environmentally induced diseases.

Objective 9

Increase to 70% the percentage of newly constructed or repaired sewage systems that comply with state standards by July 2005.

Strategies

1. Establish a baseline of newly constructed or repaired sewage systems that comply with state standards.
2. Assure that 100% of permit applications are reviewed for compliance with state standards.
3. Assure installation inspections are conducted on non-registered installers, in compliance with state standards.
4. Provide yearly training for district and local health agency environmental health personnel. (*NPSMP Goals/Objectives/Strategies B.4.i.)*

UNIVERSITY EXTENSION

Environmental Quality and Stewardship

Base Program Plan (Excerpts)

Thrust: Water Quality

The intent of University Extension's plan of work is to focus on four major areas of concern: 1) drinking water supply, 2) hazardous [toxic] materials, 3) nutrients and bacterial waste, and 4) ground/surface water and watershed protection.

The four-year plan is designed to work in concert with state and federal agencies and to provide a comprehensive matrix of educational programs that are proactive and address all aspects of water quality. This plan calls upon the entire resources of the University and the cooperation of related agencies. It is directed toward all entities and citizens and will generate new data and options to preserve the water resources of Missouri.

An interagency Water Quality Coordinating Committee (WQCC) was established in June 1989, and meets regularly to bring about an effective statewide network dealing with water quality.

To effectively focus on the issue, University Extension has recently organized a Water Quality Focus Team. The team consists of field faculty, state specialists and agency personnel. In addition, numerous state specialists from all campuses are contributing their expertise to this initiative.

Of the four major areas of concern addressed in the Water Quality base program, the greatest programming efforts will relate to effecting best management practices and nonpoint source pollution in agriculture and to the quality of life of rural citizens.

Theme 1: Drinking Water Supply

A. Private Water Supply

Objectives:

1. Obtain statewide data/information on quality of private water supply from ground and surface sources. (*NPSMP Goals/Objectives/Strategies A.2.e.l., B.3.*)
2. By 2000, test and take corrective measures where contamination exists in 10 percent of program clientele's active, private domestic wells, and place 15 percent of these private domestic wells on an annual bacteria testing program. (*NPSMP Goals/Objectives/Strategies A.2.e.h.*)
3. By 2000, inform 20 percent of program clientele with abandoned wells, and ensure that 15 percent of these have taken corrective action. (*NPSMP Goals/Objectives/Strategies B.2.q.*)

4. Instruct 100 prospective new well owners on the state water well construction standards by 2000. Seventy-five percent of the clientele will employ certified drillers and pump installers. (*NPSMP Goals/Objectives/Strategies B.2.i., B.3.k., B.4.f.g.*)
5. By 2000, persuade 25 percent of program clientele to adopt water management practices including Farmstead Assessment (Farm-a-Syst) and Homestead Assessment (Home-A-Syst) which alleviate problems related to water demand, sources, quality and supply. (*NPSMP Goals/Objectives/Strategies B.3.c.f,g,k., B.4.c.f,g,j,k.*)
6. Enhance the 4-H/Youth Water Quality school-enrichment program for 3,800 students in 125 4th to 6th grade classes that will teach the importance of ground and surface water protection and introduce students to Missouri geology and hydrology. (*NPSMP Goals/Objectives/Strategies B.3.d.f,j,k., B.4.f,g,j,k.*)
7. By 2000, inform rural and small town residents in water deficient areas of the state about alternative water sources and conservation measures. Ten percent of the contacts will develop water plans for alternative sources and conservation. (*NPSMP Goals/Objectives/Strategies A.1.e., B.3.b,c,g,j.*)
8. By 2000, plan for 20 watershed alliances to be active in communities served by drinking water reservoirs. (*NPSMP Goals/Objectives/Strategies B.2.c,d,f,g,h,j,k,m., B.3.4,5,6.c,d.*)

Implementation Plan:

1. Continue to test wells and surface supplies to increase the statewide database. Initiate programs to identify sources of contamination and remedial action. Incorporate findings into teaching materials. (*NPSMP Goals/Objectives/Strategies A.2.e,l., B.3.e,f,g,h,k.*)
2. Conduct in-service education for extension staff in support of the objectives. (*NPSMP Goals/Objectives/Strategies B.3.c.f,g,k.*)
3. Develop and expand teaching materials for use by field staff, and expand resource materials for regional specialists to assist communities in planning alternative sources, emergency supplies and water conservation measures. (*NPSMP Goals/Objectives/Strategies B.3.c.f,g,k.*)
4. Develop a reference resource library to aid state and field specialists in program delivery. (*NPSMP Goals/Objectives/Strategies B.3.c.f,g,k.*)
5. Obtain information and data from a statewide network that documents the number and frequency of wells tested, corrective measures taken, abandoned wells identified and plugged, and new wells constructed to DNR standards. (*NPSMP Goals/Objectives/Strategies A.2.e,l.*)
6. Interact with DNR, Department of Health, Natural Resources Conservation Service and local soil and water conservation district (SWCD) boards, related agencies and other organizations to coordinate efforts toward common objectives. (*NPSMP Goals/Objectives/Strategies B.3.c,g,i,j,k.*)
7. Organize demonstrations on how to properly plug wells and promote watershed management. Demonstrations will be in concert with other state agencies and located in concentrated areas of abandoned wells. (*NPSMP Goals/Objectives/Strategies A.2.e,h., B.3.c,g,i,j,k.*)
8. Continue and expand 4-H/Youth school-enrichment programs including "Water Riches" and others in the public schools. Coordinate the Water Resources education program with 75 4-H youth specialists and youth education assistants as liaisons to local schools

and youth groups. (*NPSMP Goals/Objectives/Strategies B.3,4.c,d,f,g,h,i,j,k.*)

9. Train community leaders on how to deal with issues and develop alliances for the protection and management of watersheds above drinking water reservoirs. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,h,j,k,m.*)

Evaluation Plan:

Cooperate with state agencies in data collection to determine number of wells tested, corrective measures taken, number of wells in annual testing program, number of abandoned well owners taking corrective action, number of clientele using certified drillers, number of schools participating in the water quality enrichment program, and the number of water plans for alternative sources and conservation developed by communities. Use results to measure impact.

B. Non-Community Water Supply

Objectives:

By 2000, convince 15 unincorporated villages, communities, subdivisions, and/or rural districts to develop and/or improve their common water supply.

Implementation Plan:

1. Help form community coalitions to develop water supply, conservation and protection plans through public policy education. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.*)
2. Serve as liaison with state agencies, organizations and the private sector to further develop and/or improve non-community water supplies. (*NPSMP Goals/Objectives/Strategies B.3,4,5,6.c,d,f,g,h.,j,k,m., C.2.a,b,c.*)

Evaluation Plan:

Ask community leaders involved in improving non-community water supplies to identify how extension impacted progress and results of the initiative. Use tabulated results as the basis for evaluation.

C. Community Water Supply

Objectives:

1. By 2000, provide assistance and information regarding upgrading their water supplies to 14 communities with municipal water supplies. Ten communities will respond.
2. Initiate public drinking water watershed management programs in all communities with identified water quality problems according to EPA notice of violation (NOV). (*NPSMP Goals/Objectives/Strategies B.3,4,5,6.c,d,f,g,h,j,k,m.*)

Implementation Plan:

Work with city water planners, mayors, councils, city managers and citizen groups to help them develop public policy, guidelines and long-range plans for improving the source and quality of municipal water supplies.

Evaluation Plan:

Atrazine levels will be reduced and community water supplies will remain in compliance with EPA regulation.

Theme 2: Hazardous (Toxic) Materials

More than 16 million acres of Missouri land produce row crops and forages. Most of these acres are subject to applications of restricted and nonrestricted pesticides. Consequently the potential for water degradation from pesticide use is great if they are applied indiscriminately. Based on 1984 crop-acreage data and average application rates for most commonly used pesticides, an estimated 500,000 pounds of dry and one million gallons of liquid pesticide were applied to crops in southeast Missouri alone. Present use of all forms of pesticides in the households of five million people in Missouri represent a staggering source of hazardous materials that could degrade our water if not applied according to label, used unnecessarily or disposed of improperly.

A. Water Degradation from Pesticides

Objectives:

1. By 2000, train 15,000 farmers and 1,000 commercial applicators on how pesticides can or may interact and move in soils and how to help preserve ground and surface water quality when using pesticides. Training will include sprayer calibration, container/waste product disposal, mixing procedures and safety. Thirty percent of the clientele will adopt better management practices. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,f,g,h,i,j,k.*)
2. By 2000, train and inform 4,000 homeowners and 500 commercial “lawn care” applicators on how improperly applied restricted and nonrestricted pesticides can impact the waters of the state. Twenty percent of the homeowners and 40 percent of the commercial applicators will adopt improved management practices. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,f,g,h,i,j,k.*)
3. Reduce the use of row crop pesticides by 5 percent through expanding the Integrated Pest Management (IPM) program to all crop-producing regions of the state. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,f,g,h,i,j,k.*)

Implementation Plan:

1. Continue the certification pesticide applicators training program using newly developed educational materials. Each extension pesticide educator will be given a video of the program and other training materials. Provide annual in-service education for pesticide educators for update of related issues. Incorporate results of well testing studies to demonstrate the scope of the problem. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,f,g,h,i,j,k.*)
2. Develop and expand application and spraying equipment programs and printed materials that incorporate calibration, safety and proper application techniques for farmers and commercial applicators. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)
3. Develop demonstrations, educational materials and programs to teach farmers about low-volume and low-rate pesticide technology. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)
4. Integrate information pertaining to pesticide use and application into horticulture publications and educational activities. Develop and expand teaching materials related to

yard and garden use of restricted and nonrestricted chemicals. Develop materials to be used for seminars and mass media directed toward urban audiences. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)

5. Coordinate faculty from education, chemistry, human environmental sciences, and agriculture in developing a middle school and high school level curriculum on the use of pesticides around the home and farm, the fate of pesticides in the environment and risk assessment. (*NPSMP Goals/Objectives/Strategies B.3,4.c,f,g,j.*)
6. Develop an Integrated Pest Management educational program for consultants in the private sector. Train prospective consultants and assist them in starting consulting services. (*NPSMP Goals/Objectives/Strategies B.3,4.c,f,g,i,j.*)
7. Promote where appropriate the use of biological control agents for pest management in field crops, forages and ornamentals through field demonstrations. Develop new sources of control agents. (*NPSMP Goals/Objectives/Strategies B.3,4.c,f,g,j.*)
8. Conduct an agriculture pesticide use survey for Missouri. Target geographic areas where well water testing projects are being done by university agricultural and civil engineers. (*NPSMP Goals/Objectives/Strategies B.3,4.c,f,g,j.*)

Evaluation Plan:

1. Randomly survey clientele receiving pesticide training (PAT) to determine what practices they adopted.
2. Conduct surveys to document improved management practices adopted by homeowners and commercial lawn care applicators.
3. Measure Integrated Pest Management (IPM) results by the increased number of regions participating. Pre- and post-testing will help determine results of training for NRCS field personnel.

Theme 3: Nutrients and Bacterial Contaminants

Missouri soil types and topography are very diverse, ranging from rolling wind-blown loess and river bottoms to fractured karst topography overlain with shallow, rocky clay and drainage features such as caves and sinkholes. There is no single strategy for educating landowners and residents regarding the potential for water degradation from land application of mineral elements.

Livestock/poultry is a multimillion dollar business in the state. Large numbers of hogs, dairy cattle, poultry and some beef cattle are concentrated in confinement units. The poultry industry is expanding rapidly. The Missouri approach to waste management, designed and implemented by University Extension, DNR and NRCS, has been successful. Successful as the program may be, much can be accomplished in educating producers and developing new ways of utilizing animal and poultry waste to prevent ground and surface water contamination.

Approximately 32 percent of Missourians live in rural settings and have some type of private sewer system. Many of these systems are concentrated in retirement and resort areas around the 358 lakes in the state. Most of the large lakes are located in the Ozark region, which in most cases offers severely limited soil types and topography for the proper operation of on-site wastewater treatment systems. NRCS has classified a large percentage of Missouri soil as

severely limited for siting septic systems. There is a definite need to find new answers to domestic sewage treatment and educate contractors and homeowners regarding site evaluation, proper installation and maintenance.

Many of our smaller communities need to upgrade and expand their present sewage systems, but are limited in expertise and funds to expedite needed changes. Extension community development specialists can play an active role in planning water quality protection.

A. Water Degradation by Animal/Poultry Waste

Objectives:

1. By 2000, train 1,200 poultry and livestock producers in the best management practices for land application of manures to balance crop nutrients and prevent runoff. Fifty percent of the clientele will begin development and implementation of total nutrient management systems that will meet guidelines set forth by the DNR. (*NPSMP Goals/Objectives/ Strategies B.2,3,4.b,c,d,f,g,j,k.*)
2. Train 30 consultants and technicians in the private sector by December 2000. Participants will be able to assist livestock and poultry producers in the technical design of facilities and structures that will bring them into compliance with state and federal regulations governing manure application and management. (*NPSMP Goals/Objectives/ Strategies B.2,3,4.i.*)

Implementation Plan:

1. Organize a data collection system. Work with selected producers and poultry companies to monitor litter/manure quantities and nutrient concentrations. Develop guidelines to maximize land utilization of nutrients while protecting water resources. Procure or develop a Windows-based, "farmer friendly" computer program that simplifies the task of nutrient management on farms. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,f,g,j,k.*)
2. Develop and expand teaching materials on best management practices for land application of manures to support regional specialists in program delivery.
3. Offer a training course to educate interested consultants and technicians that will qualify them to offer technical design services on animal and poultry waste management facilities. This service will help producers qualify for letters of approval (*permits*) from DNR and result in better construction of manure containment structures.
4. Provide producers with information on the effect of swine waste on water resources and updates on state and federal regulations.

Evaluation Plan:

Document the number of waste management plans impacted by Extension education programs and the number of consultants and technicians trained to assist producers.

B. Water Degradation by Mineral Elements (Plant Nutrients)

Objectives:

1. Develop a database by 2000 to determine the sources and extent of contamination in ground and surface water related to application of crop fertilizers. (*NPSMP Goals/Objectives/Strategies A.2.e,h.*)
2. By 2000, ensure that 30 percent of program clientele understand and are taking advantage of the nitrogen fertilizer replacement value of crop rotations (soybeans, alfalfa, clovers) on the succeeding crop that requires nitrogen. Nitrogen use will be reduced 20 percent for those farmers participating in this management practice. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,j,k.*)
3. By 2000, ensure that 40 percent of program clientele understand the value and limitations of nitrogen soil tests to better predict the nitrogen needs of a crop. This represents about 5 percent of the cropped acreage in a non-drought year. Nitrogen use will be reduced 10 percent by farmers using the management practice. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,j,k.*)
4. By 2000, help Missouri farmers reduce unnecessary use of non-nitrogen mineral fertilizers 10 percent through a better understanding of phosphorus, potash, and secondary and micro nutrient “crop sufficiency” needs. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)
5. By 2000, inform Missouri farmers about the benefits of precision farming. Nitrogen input will be reduced by 10 percent on crops managed by precision farming. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)

Implementation Plan:

1. Review available data. Set up a data collecting program to include the following: 1) product form (liquid, vapor, dry); 2) methods of application, e.g., anhydrous applicators, surface application with no-till planting systems, incorporation with moldboard plow or chisel, deep banding and chemigation. Research and monitor the residual chemicals and determine best management practices. (*NPSMP Goals/Objectives/Strategies A.2.e,h.*)
2. Develop teaching materials to assist regional specialists in meeting the objectives. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,j,k.*)
3. Set up demonstration plots to show the advantages of reduced nitrogen application on crops succeeding legumes. Publish results for use in farmer meetings and mass media. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)
4. Set up demonstration plots to show the value of a nitrogen soil test during the growing season to better predict actual crop needs. Publish results in usable forms for farmer meetings and mass media. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)
5. Educate landowners, faculty and crop consultants on precision/site specific farming using five on-site demonstrations across the state. (*NPSMP Goals/Objectives/Strategies B.2,3,4.*)

Evaluation Plan:

Survey clientele in selected counties to determine nitrogen reduction as a result of planned crop rotations and soil testing. Analyze fertilizer sales in those counties to determine trends in potash and phosphorus usage.

C. Water Degradation by Domestic Sewage

Objectives:

1. Work with the Missouri Department of Health to implement a state certification program for private domestic sewer contractors and backhoe operators by 1998. The underlying objective is to protect water resources in geologically sensitive areas of the state. *(NPSMP Goals/Objectives/Strategies B.2,3,f,g,h,i,k.)*
2. By 1998, inform local officials, developers, realtors, lenders and contractors about properly constructed disposal systems and nontraditional methods. Two hundred participants will adopt and/or recommend best construction practices protecting water resources. *(NPSMP Goals/Objectives/Strategies B.2,3,4.d,f,g,i.)*
3. By 2000, inform 30 percent of rural residents on private sewer systems about the impact of malfunctioning systems on water resources. Fifteen percent of those informed will maintain and/or install proper systems. *(NPSMP Goals/Objectives/Strategies B.2,3,4.d,f,g,i.)*

Implementation Plan:

1. Continue refining a training series, in concert with the Missouri Department of Health and teach workshops that will prepare sewer contractors for certification. *(NPSMP Goals/Objectives/Strategies B.2,3,f,g,h,i,k.)*
2. Develop a “rural wastewater conference” teaching package that can be orchestrated by regional specialists. Conference materials will include agenda, teaching materials, visual aids, reference materials for participants and a list of qualified and available presenters. Primary audience would be public officials, lenders, developers, realtors, contractors, plumbers and plumbing suppliers. *(NPSMP Goals/Objectives/Strategies B.2,3,4.d,f.)*
3. Produce teaching materials to be used by regional specialists to instruct clientele on properly designed and constructed septic systems and alternative methods. *(NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.)*

Evaluation Plan:

Survey homeowners and commercial interests to determine changes they have made due to Extension programming.

Theme 4: Surface/Groundwater and Watershed Protection

Soil conservation programs have been in place for years, yet certain parts of the state have been classified as having the second worst soil loss problems in the U.S. More than 16 million acres of forage and cropland must be protected from erosion. Six million of those acres are considered highly erodible. Farmers will need information to implement their conservation plans to comply with the Federal Agriculture Improvement and Reform (FAIR) Act of 1996.

To maintain or increase the quality of surface water and the benefits of important watershed components, protection, management and public education are needed. Parks, Recreation and Tourism in the School of Forestry, Fisheries and Wildlife at the University of Missouri-Columbia has access to research data and management techniques relating to wetlands, forest lands, and other watersheds and their relationships to water quality. Major research programs deal with developing best management practices on wetlands and forest lands and with water quality and management relating to rivers, streams, lakes and ponds. Pesticide impacts on water quality and fish and wildlife resources is another strength of the School of Forestry, Fisheries

and Wildlife. A close working relationship exists between the School and most of the agencies and private organizations concerned with the protection and management of the state's natural resources.

Of the 600,000 acres under irrigation in Missouri, 80 percent are located in the southeast corner of the state. Fewer than 10 percent of the irrigators use scheduling methods to determine the proper time to irrigate. In addition, chemigation (application of chemicals through irrigation) has been added to systems throughout the state and more are anticipated. Many systems lack proper safety devices to prevent backflow contamination. There is likelihood of leaching substantial quantities of chemicals into groundwater due to using too small of a stream in furrow irrigation. This problem is worsened by the use of "lay-flat" plastic pipe instead of high-pressure, rigid, gated-pipe. Very few tail-water recovery systems are used in the state. Countless well heads are not properly protected from surface water entering the aquifer around the casing. It is estimated there may be as many as 100,000 substandard wells in Missouri as set forth by the DNR.

A. Soil Erosion and Sedimentation

Objectives:

1. By 2000, help 60 percent of Extension clientele with highly erodible land use conservation tillage or other land management practices to help them carry out their conservation plan as mandated by the 1996 FAIR Act. Three million acres will be in compliance. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
2. Encourage 90 percent of regional Extension specialists who are county soil and water conservation district secretaries to take an active leadership role in district activities to promote conservation of soil and water. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.*)

Implementation Plan:

1. Expand the Extension Conservation Education Workshop to include information on the impact of crop residues on erosion, the effect of implement design on crop residues, fertilizer and weed control methods for no-till and ridge till planting systems, and cover crops for residue enhancement. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)
2. Cooperate with NRCS, FSA, Missouri Department of Conservation (MDC) and other agencies to develop educational materials and programs to help clientele increase the application of best management practices affecting their respective farm plans. (*NPSMP Goals/Objectives/Strategies B.1,2,3,4,5,6.c,d,f,g,h,i,j,k,l,m.*)
3. Produce guide sheets, slide sets and videos for regional specialists to use in educating land owners on best management practices to save soil and water.
4. Organize and conduct on-site field demonstrations on construction and maintenance of terraces, waterways, ridge-tillage and contour strip-cropping, operation and adjustment of no-till planters and drills, and measuring residue. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)

Evaluation Plan:

Tabulate the number of landowners assisted through training and identify acres affected. Compare against the objectives.

B. Irrigation, Chemigation, Well Development

Objectives:

1. By 2000, ensure that 20 percent of the irrigators in the state will employ some scientific method of scheduling time of irrigation. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)
2. By 2000, inform 200 irrigators about well head protection, tail-water recovery, chemigation safety, furrow irrigation and the use of lay-flat plastic pipe for gated pipe. Fifty percent of the participants will make changes in their management practices. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)

Implementation Plan:

1. Continue to support the Missouri Irrigation and Water Management Association and provide members with educational activities. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)
2. Continue the Annual Irrigation Conference during Ag Science Week. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)
3. Develop guide sheets and visuals to assist regional specialists with short courses and conferences. (*NPSMP Goals/Objectives/Strategies B.2,3,4.g,h,i,k.*)
4. Assist regional specialists with conducting tours and meetings on: 1) properly sizing flow for furrow irrigation; 2) tail-water recovery systems; 3) using scheduling to optimize water usage; and 4) chemigation safety. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,i,j,k.*)
5. Continue to work with NRCS and the Department of Atmospheric Science in the College of Agriculture, Food and Natural Resources at the University of Missouri-Columbia on expanding a weather station network for irrigation scheduling by seeking funding and disseminating information. (*NPSMP Goals/Objectives/Strategies B.2,3,4.g,h,i,k.*)
6. Work with NRCS, DNR, chemical companies and irrigation equipment suppliers to develop a training school for those involved in construction of irrigation wells. The training school will emphasize proper well construction/pump installation, well head protection, plugging abandoned wells and the potential hazards of chemigation to water quality. (*NPSMP Goals/Objectives/Strategies B.2,3,4.g,h,i,j,k.*)

Evaluation Plan:

Survey irrigators on use of scheduling methods, tail-water systems constructed, chemigation safety devices installed and other management practices. Compare with the objectives.

Thrust: Natural Resources and Environmental Management

Stewardship of Missouri's natural resources is vital for a sustainable future and high quality of life. Water resources provide for many uses and are dependent on watershed and ground and surface water protection. Biological resources provide for viable ecosystems that support biological diversity and wildlife habitat, as well as provide hunting, fishing and other outdoor recreational opportunities. The sales tax supporting conservation programs demonstrate that Missourians continue to expect improved management of these natural resources. They expect a safe and healthy environment and an agriculture that protects and enhances air, soil and water quality. Wise use and proper management of natural resources will provide Missourians with a continuing high quality of life and a sustainable agricultural system.

University Extension must build a system-wide commitment to education in natural resources and environmental management and provide an educational process to help Missouri citizens make decisions and take actions that will improve the quality, productivity and sustainability of natural resources. Four broad themes have been developed to address natural resources and environmental management programming for youth and adult audiences and include the following:

1. Integrated environmental and agriculture systems management
2. Watershed and surface/ground water protection
3. Biological resources
4. Environmental stewardship

County futuring sessions and statewide surveys have helped verify that environmental concerns and stewardship of natural resources are important to Missourians. Educational programs are needed that focus on ecological principles and processes, the links between individual actions and impact on local and global environments, improved decision-making skills, and an understanding of how stewardship of natural resources enhances resource sustainability, economic viability and improves the quality of life. As a result of the State-Level Program Implementation Conference, a Natural Resources and Environmental Management educational thrust was developed for the Environmental Quality and Stewardship base program.

Objectives:

1. Increase appreciation and understanding in adult and youth audiences of biological resources and native ecosystems, including why a diversity of plants, animals and ecosystems are important. Also increase awareness of unique species or species groups that are in need of conservation. By 2000, 10,000 persons will participate in this program. (*NPSMP Goals/Objectives/Strategies B.2,3,4.d,f,g,h.*)
2. Help make Missouri's agricultural producers more aware of the need for an integrated systems approach to natural resource management. (*NPSMP Goals/Objectives/Strategies B.2,3,4.d,f,g,h.*)
3. Enable agricultural producers, citizens, educators and natural resource professionals participating in integrated environmental and agricultural ecosystem workshops to voluntarily implement conservation practices and habitat enhancement techniques on their farms or ranches, or in their businesses, municipalities or communities. (*NPSMP*

Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,i,j,k,m.)

4. Increase public awareness of the importance of watershed stewardship, the benefits of wetland habitats and water quality. By 2000, educational events will reach 5,000 participants. *(NPSMP Goals/Objectives/Strategies B.2,3,4.d,f,g,h.)*

Anticipated Results/Impacts:

1. Establish greater visibility for current programs associated with natural resources and environmental management. By 2000 there will be a 10 percent increase in the number of participants in the Stewardship, Agroforestry and Natural Resource Youth Programs.
2. Develop an array of educational programs that integrate environmental and ecosystem management strategies to promote an environmentally sound agriculture. *(NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.)*
3. Enhance multi disciplinary Extension programming on issues such as biodiversity, wildlife habitat and damage management, endangered species protection, wetlands restoration and protection, agricultural and forestry production, outdoor recreation and tourism and rural and urban community revitalization. The Extension Conservation Education Workshop will be expanded to include research-based information on these topics. *(NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.)*
4. Develop educational programs that: 1) inform landowners of profitable alternatives for managing forests, fish and wildlife on their property, and 2) increase the number of acres where biological resources are integrated into land management objectives. By 2000, one hundred landowners will establish alternative resource projects on their properties. *(NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.)*
5. Develop a watershed stewardship network for communication and information related to stewardship of natural resources. *(NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.)*
6. Improve the delivery of educational programs in whole-farm planning and integrated farming systems that: 1) are environmentally sound and resource conserving, and 2) increase forest, fisheries and wildlife productivity and profitability on a sustained yield basis. By 2000, five hundred farms will implement improved natural resource management practices on 50,000 acres. *(NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.)*
7. Develop educational programs that demonstrate the economic and conservation values of agroforestry systems. By 2000, develop 10 demonstration agroforestry areas on public and private lands which will result in 1,000 acres of agroforestry program. *(NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.)*
8. Define environmental stewardship issues and improve natural resources and environmental management decision-making skills in youth and adult audiences. *(NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.)*

Theme 1: Integrated environmental and agricultural systems management

More than 16 million acres of Missouri land produce row crops and forages. The challenge to successfully sustain agricultural systems that are profitable and do not damage the state's diverse natural resource base is critical to Missouri's future environmental and economic well-being.

Objectives:

1. Develop and disseminate best management practices for an integrated systems approach to natural resource management. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
2. Teach resource professionals, Extension educators and producers the best management practices and inform them of the need for an integrated systems approach to natural resource management. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
3. Expand public knowledge, understanding and support of the positive interrelationship between agriculture and the environment. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.*)
4. Provide leadership for the enhancement, conservation and protection of Missouri's environment and biodiversity through ecosystem management. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
5. Enhance multi disciplinary Extension programming on issues such as air, water, soil, solid waste, biodiversity, wildlife and habitat enhancement and control, endangered species protection and agricultural production, and rural and urban community revitalization.
6. Work with local, state, regional and federal agencies, private entities, citizens and agricultural and natural resource groups to resolve environmental issues. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k,m.*)
7. Support Sustainable Agriculture base program action plan. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)

Implementation Plan:

1. Develop educational programs that integrate environmental and ecosystem management strategies to promote an environmentally sound agriculture.
2. Support environmental education awareness and action projects at community levels that encourage partnerships and support facilitation of environmental and natural resource conflict resolution.
3. Increase interaction and cooperation with federal and state agencies, advisory groups, and organizations for the purpose of addressing emerging issues, regulatory and policy requirements, and new legislation and to expand delivery of helpful information to landowners and other interested users.
4. Develop educational materials and curriculum that increase citizen understanding of the array of benefits that result from investments in habitat enhancement and management of fish and wildlife resources. Also show the potential incentives from making recreational access to these resources available to diverse groups of users. By 2000, educational events will reach five hundred participants in this program.

Evaluation Plan:

1. Determine if 75 percent of Missouri's agricultural producers have been made aware of the need for an integrated systems approach to natural resource management.
2. Determine if 25 percent of the agricultural producers, citizens, educators and natural resource professionals participating in integrated environmental and agricultural ecosystem workshops can voluntarily implement conservation practices and habitat enhancement techniques on their farm, ranch or in their business, municipality or community.

Theme 2: Surface/groundwater and watershed protection

Surface water covers 2 percent of Missouri and includes 56,000 miles of streams and rivers, 14 major reservoirs that encompass more than 315,000 acres, 300,000 ponds and lakes covering 250,000 acres, and more than 1,100 recorded springs. These 900,000 total acres of water provide many ecological and economic benefits to Missourians. However, this resource continues to be subject to runoff from a wide spectrum of watersheds ranging from cultivated river hills and bottom land to the forested Ozarks.

Approximately 29 percent of this watershed area is forest land. Wetlands are another important watershed component in need of restoration and protection. For example, of the original 2.4 million acres of bottom land hardwood forests in southeast Missouri, less than 60,000 acres, or 2 percent, remain today. According to wetland inventory data, 95 percent has been totally eliminated through channelization, tributary modifications, urban development and industrial encroachments. Surface and subsurface drainage has also eliminated wetlands and resulted in increased sediment from soil erosion filling lakes and streams.

Objective:

Develop educational programs that establish the relationship between wise land and watershed stewardship and economic and social factors such as tourism, community development potentials, land values, maintaining biological diversity and quality of life.

Implementation Plan:

1. In collaboration with the Water Quality Focus Team and partners, develop educational materials to support programs that teach and demonstrate best management practices for habitat management, water management and watershed protection. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
2. In target watersheds, provide localized best management practice recommendations for reducing agricultural pesticide runoff. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,i,j,k,m.*)
3. Create public awareness of the importance of water quality for fisheries and wildlife resources. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
4. Conduct educational programs focusing on protection of water quality and fisheries and wildlife habitat using stream stewardship techniques and proper management of riparian buffer zones. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)

Evaluation Plan:

1. Determine number of acres enrolled in streams for the future programs and stream

- stewardship incentive programs.
2. Determine number of acres impacted by watershed alliances and other watershed stewardship programs as a result of educational and technical assistance opportunities.
3. Conduct baseline and follow-up surveys to determine changes in watershed stewardship knowledge, opinions and attitudes.
4. Determine number of acres enrolled in wetland restoration and protection programs.

Theme 3: Biological Resources

Supplies of fish and wildlife are influenced by changing land and water uses. In Missouri, approximately 95 percent of the diverse land base is privately owned. The future of fisheries and wildlife conservation depends to a large extent on the land-use decisions made by landowners. Expanded educational programs are needed to enable landowners and managers to make informed decisions regarding the wise stewardship and conservation of fish and wildlife resources. More than 70 percent of the five million Missouri residents have participated in fish and wildlife activities. The demand for wildlife and fisheries resources from private lands, as well as for associated economic and recreational opportunities, continues to increase.

Missouri has more than 13 million acres of forest land. (*While professional foresters view this land as*) producing less than one-half of its potential for wood products (*newer technologies such as chip mills and whole log exportation may rapidly increase forest output*). Educational programs combined with on-the-ground technical assistance are needed to create awareness of the potentials for improved income, reduced energy costs, enhanced wildlife habitat, reduced soil erosion, improved water quality and other benefits that can be improved through proper forest resource management practices. Less than 15 percent of the 200,000 private landowners apply any intensive woodland management or use the professional forestry services available to them.

Objectives:

1. Increase the number of acres where biological resources are integrated to provide compatible and beneficial functions and ensure the diversity of native wild plants and animals. By 2000, four hundred landowners will integrate management of biological resources into their land management objectives. (*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)
2. Increase appreciation and understanding in adult and youth audiences of biological resources and native ecosystems, including why a diversity of plants, animals and ecosystems is important. Also increase awareness of unique species or species groups that are in need of conservation.
3. Increase acres devoted to agroforestry systems by 10 percent and increase the number of landowners incorporating a forest stewardship plan and improving the forest resource through proper management. (*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)
4. Increase multi disciplinary program planning for management of agricultural, forest and urban lands and waters that provide landowners with profitable alternatives for managing forest, fish and wildlife on their lands to meet individual or community objectives. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k.*)
5. Improve the delivery of educational programs in whole-farm planning and integrated farming systems that are environmentally sound, resource conserving and that increase

forest, fisheries and wildlife productivity and profitability on a sustained yield basis.
(*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)

Implementation Plan:

1. Develop in-service education opportunities, programs, workshops, publications and other educational materials to show how Missouri citizens can increase the integration of biological resources into their land management activities. (*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)
2. Develop educational materials explaining: 1) the ecological importance of, 2) the economic benefits of, and 3) how and where to establish agroforestry plantings. (*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)
3. Develop educational materials and programs that demonstrate conservation of prairie and wetland ecosystems. Collaborate with partners to deliver educational activities designed to conserve these ecosystems. (*NPSMP Goals/Objectives/Strategies B.2,3,4,f,g,i,j,k.*)
4. Collaborate with partners to facilitate holistic and workable management approaches on private lands, acreages, backyards and other landscapes. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,i,j,k.*)
5. (Not Applicable to NPS)
6. Develop educational programs that encourage people to commit to helping improve the environment. Monitor actions taken as a result of these commitments. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,i,j,k.*)
7. Develop in-service training programs, workshops, publications and other educational approaches that illustrate the interdependencies among agriculture, natural resources and people; that foster a stewardship ethic; and that explain the meaning and importance of ecosystem management and biological diversity. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.c,d,f,g,i,j,k.*)
8. Develop educational materials and conduct training workshops for audiences designed to decrease wildlife damage and human/wildlife conflicts by using cost-effective technologies to prevent and control economic losses, property damage and potential health hazards caused by problem wildlife.

Evaluation Plan:

1. Survey number of acres enrolled in habitat incentive programs, number of conservation practices implemented as a result of educational programs, and technical assistance opportunities offered through federal, state and private organizations. Determine the number of farms and individuals who adopt practices that enhance long-term conservation of biological resources.
2. Conduct baseline and follow-up surveys to determine changes in biological resources stewardship, knowledge, opinions and attitudes.

Theme 4: Environmental Stewardship

County futuring sessions and statewide surveys have helped verify that environmental concerns and stewardship of natural resources are important to Missouri citizens. These include water quality; solid, hazardous, animal and human waste disposal; the safe use of pesticides; and the

need for increased conservation of the natural resource base.

Objective:

Increase understanding in adult and youth audiences of how stewardship of natural resources improves the quality of life and enhances resource sustainability and economic viability.

Implementation Plan:

1. Along with partners, gather additional baseline information to determine the primary natural resource and environmental management issues Missourians consider important, environmental stewardship, quality of life and economic sustainability. Determine extent of their knowledge, opinions and attitudes about these issues.
2. Develop educational programs and materials for youth and adults that focus on ecological principles and processes, the links between individual actions and impacts on local and global environments, and improved decision-making skills based on environmental stewardship. By 2000, 1500 youth and adult leaders will participate in wildlife habitat evaluation educational programs. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)
3. Develop educational programs that motivate landowners to improve land stewardship capabilities and provide information on technical assistance and habitat incentive programs. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k.*)
4. Prepare educational materials for all age groups designed to highlight environmental stewardship issues and improve natural resource and environmental management capabilities. (*NPSMP Goals/Objectives/Strategies B.2,3,4,5,6.b,c,d,f,g,i,j,k.*)

Evaluation plan:

Conduct baseline and follow-up surveys to determine changes in environmental stewardship knowledge, opinions and attitudes.

Thrust: Solid waste

Theme: Compostable Waste Disposal

Environmental issues such as solid waste disposal and proper application of animal waste are important parts of many county plans. Missouri is a leading state nationwide in terms of animal agriculture and (*could*) continue to be progressive given a (*cooperative*) climate that encourages new methods of animal waste handling and disposal. One alternative to conventional methods of disposal for solid and animal wastes is the use of composting. This method can result in reduction in organic waste entering the waste stream and provide an end product that will be easier to handle than conventional animal waste systems.

Objectives:

1. Determine the economic feasibility of using composting methods to dispose of solid and animal waste.
2. Develop models of alternative waste handling systems that are feasible for individual livestock producers to incorporate into existing facilities.
3. Encourage development of new markets to make use of the end products from these

alternative systems.

4. Reduce amount of solid waste entering the waste stream.
5. Collect research data to ensure that new procedures are environmentally sound.

Implementation Plan:

1. Develop models and collect data of systems that will be used on individual animal facilities.
2. Gain recognition from regulatory agencies that alternative methods of animal waste disposal are environmentally safe.
3. Determine portions of the solid waste stream that can be incorporated into these models.
4. Analyze byproducts from the alternative waste disposal systems for uses and environmental consequences.
5. Determine alternative markets for the end product.
6. Encourage producers to adopt alternative systems of animal waste disposal that are economically feasible and environmentally friendly. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,i,j,k.*)

Evaluation Plan:

Determine the amount of waste diverted from the solid waste stream, number of producers adopting new technologies and markets developed for byproducts produced.

MISSOURI DEPARTMENT OF AGRICULTURE

Strategic Plan (Excerpts)

II. PUBLIC HEALTH AND THE ENVIRONMENT

Issue:

The public benefits of U.S. agriculture over the last fifty years have been tremendous: unequaled food safety and food quality, the lowest food costs in the world, improved human health, large trade surpluses, products made from renewable resources, and increased environmental sustainability. However, despite these widespread improvements, the public is increasingly concerned about environmental and food safety issues. The ability to satisfy the public's need for food, shelter and clothing must be balanced with the need to protect public health, the environment, and agricultural resources.

Goal:

To protect, preserve, and promote public health, the environment, and agricultural resources.

Outcome A:

Prosperous and sustainable livestock and poultry production.

Outcome Measures:

1. Number of dollars of new investment in environmental practices and collection/processing activities as a result of the Animal Waste Treatment System Loan Program. (*NPSMP Goals/Objectives/Strategies B.2,3.a,b,e.*)
2. Number of livestock producers able to obtain low-cost financing as a result of the Animal Waste Treatment System Loan Program. (*NPSMP Goals/Objectives/Strategies B.2,3,4.a,b,e.*)
3. Number of improper dead animal disposal cases.
4. Number of livestock source pollution violations.
5. Percentage of livestock producers utilizing nutrient management plans. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,d,e,f,h,j.*)

Animal Waste Treatment Objective:

Originate loans for animal waste treatment systems in amounts of \$1,000,000 in fiscal years 1999, 2000 and 2001.

Strategies:

1. Network with lenders, commodity groups, banking associations and appropriate state and federal agencies involved in construction of animal waste treatment systems to promote the program. (*NPSMP Goals/Objectives/Strategies B.2,3.a,b,c,d,h,j.*)
2. Encourage lenders participating in the Authority's loan-guarantee program to refer, when appropriate, livestock and poultry producers to the Authority for participation in

the Authority's Animal Waste Treatment System Loan Program, reducing the risk for the lender and reducing the interest rate for the producer.

3. Investigate utilization of the Department of Agriculture's Internet home page to make animal waste program information and applications available. (*NPSMP Goals/Objectives/Strategies B.2,3,4.c,g.*)
4. Investigate linkage of other lender associations' and commodity groups' home pages and the Department of Agriculture's Internet home page.
5. Collaborate with other MDA divisions to provide information at appropriate marketing events and utilize all other available resources to promote program.

Dead Animal and Nutrient Management Objectives:

1. Decrease the number of improper dead animal disposals by 30 percent (i.e. from 288 cases to 200) by July 2001. (*NPSMP Goals/Objectives/Strategies B.2,3.c,d,f,j.*)
2. Decrease livestock agriculture source pollution violations by 33 percent (i.e. from 21 to 14) by July 2001.
3. Increase the number of producers utilizing nutrient management plans by 25 percent by July 2000. (*NPSMP Goals/Objectives/Strategies B.23,4.c,d,e,f,h,j.*)

Strategies:

1. Inform and educate producers of laws governing the disposal of dead animals. (*NPSMP Goals/Objectives/Strategies B.2,3,4.g.*)
2. Inspect rendering plants, substations and trucks for compliance with Chapter 269.
3. Assist producers in observing nutrient management plan guidelines. (*NPSMP Goals/Objectives/Strategies B.2,3.d,f,h,i,j.*)
4. Provide technical assistance to new animal production facilities to make sure they comply with environmental laws. (*NPSMP Goals/Objectives/Strategies B.2,3,4.e,d,f,g,h,i,j.*)

Outcome D:

Proper use of pesticides.

Outcome Measure:

Percentage of investigations/inspections verifying compliance with pesticide regulations. (Targets: Registration = 100%, Certification = 100%, Application = 100%).

Objective:

To annually maintain compliance rates of inspections involving licensing, registration, mixing, storing, disposal and application of pesticides at or above 95%.

Objective Measure:

Number of verified violations involving licensing, registration, mixing, storing, disposal, and/or application of pesticides.

Strategies:

1. Work closely with University Extension and the U.S. Environmental Protection Agency in developing and maintaining pesticide applicator training programs for certification and recertification of pesticide applicators. (*NPSMP Goals/Objectives/Strategies B.4.g,i,j.*)
2. Work closely with University Extension to develop and maintain study manuals for training and examinations. (*NPSMP Goals/Objectives/Strategies B.4.g,i,j.*)
3. Continually review and revise pesticide applicator and dealer examinations based upon the standards of competence defined in the Missouri Pesticide Use Act.
4. Offer pesticide applicator and dealer examinations throughout the state a minimum of 35 times per year.
5. Issue pesticide applicator and dealer licenses in a timely manner.
6. Annually establish the minimum number of pesticide inspections to be completed for the following: commercial applicator licenses; commercial applicator records; pesticide technician licenses; pesticide technician training records; pesticide technician training programs; noncommercial applicator licenses; noncommercial applicator records; public operator licenses; public operator records; dealer licenses; dealer records; use; and direct supervision.
7. Register pesticides offered for sale in the state and maintain current labels on file.
8. Utilize computer and software capabilities to develop and maintain databases to improve program development, efficiency, and decision making.
9. Draft and seek approval from the U.S. Environmental Protection Agency for State Management Plans pertaining to the use of certain pesticides in the state.
10. Design and Implement pesticide worker protection program activities as prescribed by the U.S. Environmental Protection Agency.
11. Design and implement endangered species protection programs in accordance with guidelines of the U.S. Environmental Protection Agency.
12. Annually review and make necessary revisions to the Pesticide Program Enforcement Response Guidance and Civil Penalty Matrix in cooperation with the Environmental Protection Agency. (*NPSMP Goals/Objectives/Strategies B.2,3.*)
13. Investigate feedstuffs suspected to be adulterated with pesticides, poisons and deleterious substances.

Outcome E:

Reduced reliance on non-renewable resources in agricultural production.

Outcome Measure:

Percent reduction of non-renewable resources used in active agricultural production projects.

Objective:

To increase the number of farmers and acres of farmland adopting sustainable agriculture strategies as a result of this program from 20 to 200 farmers and from 1000 to 10,000 acres by December 2001.

Strategies:

1. Provide incentive for participation through demonstration project awards to Missouri farmers annually (23 in 1999).
2. Develop agricultural technologies and farm management strategies which provide incentive (both economic and environmental) to all farmers, especially those who have not participated in the program. (*NPSMP Goals/Objectives/Strategies B.2,3,4.f,g,h,j.*)
3. Establish a more effective means of reaching farmers who have not participated in the program (radio, direct mail, University Extension offices, etc.).
4. Enlist the cooperation of local University Extension personnel in promoting participation in the program. (*NPSMP Goals/Objectives/Strategies B.3.k.*)
5. Ensure all agricultural areas of the state are represented in the program.
6. Develop a plan for informing local farmers and residents when and where field days and tours will occur. (*NPSMP Goals/Objectives/Strategies B.3,4.b,c,d,e,g,k,j.*)
7. Publicize conferences to increase attendance.
8. Maintain educational information in University Extension offices. (*NPSMP Goals/Objectives/Strategies B.3,4.c,d,e,g,j.*)
9. Develop a summary of each completed project and publish within one year of completion.
10. Distribute summaries to all interested persons upon request.
11. Have a project summary available at all meetings, conferences, etc.
12. Ensure that each project has some type of educational outreach activity annually (field days, literature, etc.). (*NPSMP Goals/Objectives/Strategies B.3,4.c,d,e,g,j.*)

MISSOURI DEPARTMENT OF CONSERVATION

Strategic Plan (Excerpts)

Public Land and Water

Public land and water are important for managing fish, forest and wildlife resources and providing associated uses. Public ownership provides opportunities to dedicate areas for specific management activities and uses. Moreover, sensitive or critical resources can be protected, restored, and enhanced through direct regulation of public access or use. Well managed Department lands and waters should provide the best examples of what is possible under various conditions, and should serve as demonstration areas for interested citizens.

Goal I

Protect, sustain, enhance, restore or create fish, forest and wildlife communities on department and other public land and water consistent with regional needs, resource capabilities and authorities.

Objective I.3

Encourage agencies and organizations to protect, sustain, enhance, restore, or create representative fish, forest and wildlife communities on land and water under their jurisdiction.

Strategies:

- a) Seek cooperative agreements with other agencies that capitalize on combined resources (i.e., personnel, expertise, and funding). (*NPSMP Goals/Objectives/Strategies B.3.k.*)
- b) Involve appropriate agencies and organizations. (*NPSMP Goals/Objectives/Strategies C.2.*)
- c) Work with agencies for the protection and restoration of floodways and to increase riverine habitat on the Missouri, Mississippi and other major rivers. (*NPSMP Goals/Objectives/Strategies C.2.b.*)
- d) Assure that fish and wildlife habitat development receives adequate consideration in project operation of large reservoirs.
- e) Provide assistance or research support to help guide the application of resource management. (*NPSMP Goals/Objectives/Strategies A.2.a,b,c,d,e,f,g.*)

Objective I.4

Assist local governments with planning, development, enhancement and protection of urban natural resources. (*NPSMP Goals/Objectives/Strategies B.4.c,f,h,j,m.*)

Strategies:

- a) Identify and pursue partnerships with local public and private entities. (*NPSMP Goals/Objectives/Strategies B.3.*)

- b) Assess and support appropriate green space, greenways, wildlife corridors, trails and similar open space developments in urban areas.
- c) Provide direct financial assistance, as appropriate, to local governments that make a commitment to improving the urban environment for fish, forests and wildlife.

Goal III

Increase opportunities for use of fish, forest and wildlife resources on other public land and water.

Objective III.1

Establish agreements and cooperative partnerships with agencies and organizations to facilitate management and use of fish, forest and wildlife resources on public and quasi-public land and water.

Strategies:

- a) Work with neighboring states and the federal government to effectively manage inter-jurisdictional waters for healthy habitats, biota and compatible public use. (*NPSMP Goals/Objectives/Strategies B.3.*)
- b) Coordinate recreation opportunities between the Department and other public and quasi-public land and water.
- c) Explore feasibility of revising the Community Assistance Programs to more fully integrate forest, fish and wildlife resources and related opportunities.
- d) Provide technical and financial assistance to encourage management and use of resources on other public lands. (*NPSMP Goals/Objectives/Strategies B.3.h.*)
- e) Work with the owners and operators of large reservoirs and other affected interests to ensure that fish, wildlife and recreation are adequately considered in project operation.
- f) Work with government entities and the private sector to promote use, enjoyment and appreciation of river and stream resources. (*NPSMP Goals/Objectives/Strategies B.3,4.g.*)

Private Land and Water

The potential to achieve positive resource management goals in concert with landowners is immense; however, capitalizing on this potential will require a wide array of services, incentives, educational programs and support. Moreover, development and presentation of private land management programs must be predicated on landowner needs and desires as well as sound resource management principles. It also is imperative that these efforts be well coordinated to achieve efficient delivery of services without reducing effectiveness.

Goal I

Protect, sustain, enhance, restore or create fish, forest and wildlife resources and communities on private land and water consistent with landowner needs and resource capabilities.

Objective I.1

Provide programs and services to assist landowners in meeting their fish, forest and wildlife management objectives in a manner that acknowledges and complements the wide range of reasons for which people own land.

Strategies:

- a) Identify important regional resource needs that can only be met on private land; regionally target and promote resource management by private landowners. *(NPSMP Goals/Objectives/Strategies A.h.)*
- b) Enhance our understanding of landowner objectives; focus direct technical assistance on those landowners who demonstrate commitment to long-term resource management; offer services and recommendations commensurate with the landowner's ability to implement them. *(NPSMP Goals/Objectives/Strategies B.4.h.)*
- c) Educate landowners regarding inter-relationships of plant and animal communities and land use; develop a publication dedicated to landowners and related issues. *(NPSMP Goals/Objectives/Strategies B.4.g.h.)*
- d) Evaluate and modify Department programs that involve professional guidance, technical assistance, and financial incentives to private landowners to ensure long-term effectiveness; develop and/or promote incentives to private landowners to encourage sustainable resource management. *(NPSMP Goals/Objectives/Strategies B.h.)*
- e) Develop in-house software containing all landowner incentive programs to keep field staff up-to-date.
- f) Apply a multi-disciplinary approach to coordination of private land management services, and cross-train appropriate Department staff in all available private land management services, programs and incentives.
- g) Work to improve land use practices; protect and restore riparian corridors, instream habitat, and promote water quality; design suitable programs and incentives. *(NPSMP Goals/Objectives/Strategies B., C.2.b.)*
- h) Develop an expanded nuisance wildlife/damage control program.

Objective I.2

Identify and pursue land and resource management partnerships with private conservation organizations, land trusts, businesses and other non-governmental organizations.

Strategies:

- a) Explore development of cost-share programs with private organizations, industry and other entities to promote fish, forest and wildlife enhancement. *(NPSMP Goals/Objectives/Strategies B.3.h.)*
- b) Seek assistance from conservation organizations and corporations as co-sponsors for major grant proposals. *(NPSMP Goals/Objectives/Strategies B.3.)*

Objective I.3

Encourage and support local, state and federal initiatives that complement or promote fish, forest and wildlife management opportunities on private land and water.

Strategies:

- a) Work to maintain or improve conservation provisions in the 1995 Farm Bill (e.g., CRP, WRP, SIP, etc.).
- b) Offer clearinghouse functions, technical assistance or information for the various financial incentives available for fish forest and wildlife management on private land and water. (*NPSMP Goals/Objectives/Strategies B.4.h.*)
- c) Explore development of cost-share programs with other state, federal, industry and local community entities to promote fish, forest and wildlife enhancement. (*NPSMP Goals/Objectives/Strategies B.3.h.*)
- d) Seek common ground with local, state and federal agencies and work through their delivery systems to accomplish compatible resource management goals; ensure appropriate level of Department recognition. (*NPSMP Goals/Objectives/Strategies B.3.k., C.2.c.*)

Goal III

Improve protection and management of fish, forest and wildlife resources within the urban environment.

Objective III.1

Assist and support municipal resource managers in managing urban natural resources.

Strategies:

- a) Work with providers of fish, forest and wildlife management programs, products and services for urban residents to ensure that their activities are compatible with and contribute to the protection and improvement of urban fish, forest and wildlife resources. (*NPSMP Goals/Objectives/Strategies C.2.c,k.*)
- b) Assist in managing wildlife populations in urban areas.

Objective III.2

Develop programs, products and services that help urban landowners use, manage and improve the fish, forest and wildlife resources on their property, and in their neighborhoods and communities.

Strategies:

- a) Provide technical assistance and advice to help urban residents deal with problem wildlife, forest insects and diseases and related problems.
- b) Expand conservation related, outdoor recreational opportunities for urban residents. (*NPSMP Goals/Objectives/Strategies B.4.g.*)
- c) Assist with preserving greenspace in rapidly developing areas by offering advice and assistance to related urban interest groups. (*NPSMP Goals/Objectives/Strategies B.4.h.*)

- d) Provide homesite management programs, materials, and assistance that encourages naturescaping and backyard wildlife, and discourages use of chemicals and urban runoff. (*NPSMP Goals/Objectives/Strategies B.4.c,f,g,h.*)
- e) Provide seminars and workshops for urban residents about fish, forest and wildlife topics and activities; expand the use of mass media in urban areas. (*NPSMP Goals/Objectives/Strategies B.4.g.*)

Education and Interpretation

Citizens must understand the importance and relationship of fish, forests and wildlife to their overall quality of life and economic well being if they are to embrace conservation. Many Department activities directly affect the resources under our auspices; however, without a Department/public partnership, achieving our constitutional mandate is impossible. Educating children and adults, about all aspects of conservation, may be the single most important task we do as an agency.

Goal I

Increase knowledge and understanding among Missourians of fish, forest and wildlife resources, natural communities and ecosystems, and the relationship of people to the natural resources.

Objective I.2

Increase emphasis and teaching of conservation principles as part of public, private and parochial school curricula. (*NPSMP Goals/Objectives/Strategies B.4.g.*)

Strategies:

- a) Increase the use of conservation curriculum materials in schools, and employ direct delivery of certain conservation programs.
- b) Promote and increase the incorporation of conservation in key skills and core competencies.

Objective I.3

Teach Missourians the social, cultural and biological relationships that exist between people and fish, forest and wildlife resources. (*NPSMP Goals/Objectives/Strategies B.4.*)

Strategies:

- a) Emphasize conservation as the foundation of sustainable use.
- b) Emphasize relationships between natural systems and human population, urban sprawl and development.
- c) Develop and pursue activities that enhance the knowledge and understanding of natural resources held by urbanites, inner-city citizens and groups of differing cultural backgrounds.
- d) Develop materials and programs that target the important impacts of various agricultural practices of various agricultural practices on fish, forest and wildlife resources.
- e) Emphasize the benefits of healthy stream and aquatic resources as part of new and existing materials and programs.

NATURAL RESOURCES CONSERVATION SERVICE

Strategic Plan (Excerpts)

Soil and water resources are inextricably linked. Water resource management is built on the foundation of effective soil conservation and management. The reduced erosion and runoff from cropland that will be achieved by hitting the 2002 targets for soil resources will make a substantial contribution to reaching our goals for water resources. Good soil conservation alone, however, will not ensure that adequate supplies of clean water are available to support people, communities, agriculture, and the environment.

The quantity and quality of our water supplies are largely determined by climate and the way we manage our land. Careful management of watersheds--the land that captures, stores, and supplies water to streams, lakes, rivers, reservoirs, and aquifers--is essential to ensuring sufficient supplies of high quality water to sustain our economy and the environment. Careful assessment of seasonally variable supplies and management of the way we use water resources to irrigate crops or sustain communities is also a critical component of effective watershed management.

Outcome

Water supplies in sufficient quality and quantity to sustain people, communities, wildlife, agricultural production and aquatic ecosystems.

2002 Targets (national)

- ◆ Beginning in the year 2002, water supply and water quality goals set by local communities achieved in 100 new watersheds each year.
- ◆ Potential for delivery of sediment, nutrients, pesticides, or salts from agricultural land to water bodies reduced by 25 percent from 1992 levels.
- ◆ Efficiency of irrigation water utilization improved by 3 percent from 1990 levels.

Significant actions

1. Accelerate training and build technical capacity of field staff and partners to emphasize water quality and water conservation in ongoing conservation planning for landowners and communities. (*NPSMP Goals/Objectives/Strategies B.4.i.*)
2. Undertake national prevention initiatives to address five critical natural resource concerns with high potential for water quality or supply impairment:
 - ◆ ephemeral gully erosion
 - ◆ streambank and streambed erosion
 - ◆ irrigation water use and management
 - ◆ management and use of manures
 - ◆ erosion and runoff from developed or construction sites (*NPSMP Goals/Objectives/Strategies B.*)

3. Use the Conservation Reserve Program to achieve widespread use of riparian buffers, filter strips, grassed waterways and other vegetative buffer strips. (*NPSMP Goals/Objectives/Strategies B.3.f.*)
4. Enhance the agency's capability to evaluate and predict the effects of land use and management on water quality and water supply. (*NPSMP Goals/Objectives/Strategies A.2.*)

Strategic approach

Work with our partners to complete a comprehensive water resource needs assessment

Significant actions

1. Work with conservation districts through the locally led conservation initiative to compile water resource conservation needs assessments. (*NPSMP Goals/Objectives/Strategies A.1.*)
2. Work with EPA, USGS, NOAA, state conservation agencies, state water quality agencies, and other governmental and non-governmental partners to complete a scientifically based national inventory of the quality and quantity of groundwater and surface waters. (*NPSMP Goals/Objectives/Strategies A.*)

Strategic approach

Provide coordinated assistance to priority watersheds. (*NPSMP Goals/Objectives/Strategies B.*)

Significant actions

1. Complete conservation needs assessments through locally led conservation initiatives to identify watersheds with (a) urgent water supply or water quality problems, and (b) high-value water resources that require enhanced conservation assistance to prevent impairment. (*NPSMP Goals/Objectives/Strategies A.1.*)
2. Concentrate assistance through 1996 Act programs to provide enhanced assistance in priority watersheds to improve or prevent degradation of water supplies or water quality. (*NPSMP Goals/Objectives/Strategies B.b.*)
3. Leverage NRCS technical and financial assistance with that of local groups, agencies, and organizations in order to secure the full measure of resources needed to implement watershed solutions. (*NPSMP Goals/Objectives/Strategies B.3.k.*)
4. Develop multi-state specialized water resource assessment and planning teams to assist communities and watersheds in improving or protecting their water resources. (*NPSMP Goals/Objectives/Strategies B.3.c.*)
5. Develop watershed assessment and modeling tools for field application by water resource teams to guide watershed planning. (*NPSMP Goals/Objectives/Strategies A.2.o.*)

Strategic Issue 5 (North Central/Midwest Region)

Pesticide, Nutrient, and Manure Management

There are 129 million acres of cropland in the Region (34 percent of the national total). This is 44 percent of the total land within the Region. It is estimated that over half of the cropland needs some type of conservation treatment to adequately protect resources. The Region produces two-thirds of the nation's corn and soybeans. Commercial fertilizer, herbicides, and insecticides are used to increase production of these commodities. They are also widely used in rural and urban communities for turfgrass and horticultural applications.

There are also significant livestock and poultry numbers in the Region; including 16 million beef cattle, 5.7 million dairy cattle, 37 million hogs, 215 million chickens, and 96 million turkeys. These livestock generate 300 million tons of manure annually. The manure that is spread on farmland contains an estimated 780,000 tons of nitrogen and 580,000 tons of phosphorous. Because of economic factors, livestock and poultry production facilities are increasing in size and becoming more concentrated which results in greater threats to natural resource health.

Runoff and infiltration from rainfall, snowmelt, and irrigation water carry nutrients, organics, pesticides, and pathogens. This impacts surface and ground water quality as well as aquatic habitats. Recent studies have indicated that much of the region's soils have high phosphate levels, which may be an indicator of lands receiving too much manure or commercial fertilizer.

Goals

- ◆ Provide science-based information to customers in order to accelerate understanding and adoption of acceptable practices associated with pesticide, nutrient, and manure management
- ◆ Implement watershed-based nutrient and pest management plans
- ◆ Provide additional technical support for direct assistance to develop and implement watershed-based water quality plans for land managers

Desired Results

Nutrients, pesticides and manure are applied at rates that maximize production while minimizing damages to the region's surface and ground water. Highest and best use for all water in the region is achieved while maintaining economic viability and resource sustainability.

Water Quality and Quantity (Missouri Goals)

From lakes and streams to groundwater, Missouri's water quality, and quantity is fundamentally important to the health and economic prosperity of its citizens.

Sediment...has degraded the quality of streams and reduced the storage capacity of lakes and reservoirs. Sedimentation is particularly troublesome in areas with extensive rowcrop production, where streams have been channelized, and in urban areas with rapid development.

Nitrogen and phosphorus are plant nutrients that have caused excessive growth of algae and bacteria in Missouri lakes and streams. The primary sources of these plant nutrients are

excessive fertilizer application to cropland, poor animal waste management practices, and urban runoff.

Pesticide runoff has become a problem in a number of communities in north Missouri. Groundwater is naturally saline in much of north Missouri so residents must depend on surface reservoirs for drinking water. When rowcrops are extensively grown in the watersheds that supply their reservoirs, the pesticides used to produce these crops have been found in drinking water supplies. There has been recent concern over concentrations of atrazine in a number of these reservoirs that exceed the maximum levels established by the U.S. EPA.

- ◆ In 1994, 49 of Missouri's 102 surface water supplies had pesticide detects and 10 exceeded the maximum contaminant level (MCL) for atrazine.
- ◆ Animal waste management is a statewide concern. The Ozarks Region has received the most attention due to high quality streams and lakes in the region. Increased poultry and confined hog operations are emerging statewide issues. Recently, several significant animal waste spills from large corporate hog farms have occurred.
- ◆ Groundwater is the primary source of drinking water for many Missouri communities. While groundwater quantity is abundant throughout most of south Missouri, quality has been degraded in some areas by runoff of contaminants into sinkholes, losing streams, and abandoned wells.

Strategies

1. Accelerate the adoption of practices that reduce the sediment, pesticides, and nutrient delivery to Missouri's surface and groundwater (*NPSMP Goals/Objectives/Strategies B.1,2,f.*)
2. Provide increased assistance to communities that have identified problems with their drinking water quality and supply. (*NPSMP Goals/Objectives/Strategies B.4.c,h.*)
3. Expand irrigation water management methods and technology throughout the "Bootheel" of southeast Missouri through accelerated technical assistance. (*NPSMP Goals/Objectives/Strategies B.4.h.*)
4. Assist the conservation partnership in efforts to educate Missouri residents about the critical nature of water quality and quantity. (*NPSMP Goals/Objectives/Strategies B.4.g.*)
5. Develop new technology and practice application for land use management on a watershed basis.
6. Form a unified coalition to address Missouri's water resources. (*NPSMP Goals/Objectives/Strategies C.2.*)
7. Expand the Special Area Land Treatment (SALT) Program into agricultural nonpoint source pollution control. (*NPSMP Goals/Objectives/Strategies B.3.*)

Expectations

- ◆ An enlightened citizenry who are educated and outspoken in the wise use of Missouri's water resources

- ◆ Conservation practices and methods are adopted by land users that are economical, yet have a positive scientific-based but economical impact on water
- ◆ Land use planning based on sound ecological and watershed principles
- ◆ Conservation partners working together to maximize on each other's programs and actions to ensure water quality and quantity for Missouri residents

MARK TWAIN NATIONAL FOREST

Strategic Plan (Excerpts)

Chapter IV Forest Management Direction

Forest Management Goals (excerpts)

Wildlife/Fisheries Management Goals

Qualify, quantify and provide habitat for indicator species.

Manage habitat found on the Mark Twain National Forest to at least maintain viable populations of all existing native and desired non-native vertebrates.

Provide a habitat management program that responds to the demand for both consumptive and nonconsumptive fish and wildlife use.

Provide for wildlife species requiring specialized habitat including those recognized by both Federal and State authorities as being threatened, endangered, rare or sensitive.

Soil, Water and Air Management Goals

Identify a program that ensures the maintenance of soil productivity and the achievement of water and air quality objectives.

Objectives

Water and Soil Resource Management

Operations

The Forest Service, its permittees, and contractors, shall comply with or exceed all requirements of the State Water Quality Plan.

Management practices will be designed to minimize nonpoint pollution. (*NPSMP Goals/Objectives/Strategies B.*)

Maintenance of water quality will be achieved by the application of best management practices as defined by Forest Plan standards and guidelines. (*NPSMP Goals/Objectives/Strategies B.*)

Minimize soil compaction by curtailing the use of heavy equipment during extended wet periods on soils highly subject to compaction.

Soil scarification or ripping practices may be used in meeting restoration objectives when soil compaction limits effective revegetation or has resulted in reduced soil productivity.

The following filter strip widths will be used. Exceptions for smaller filter strips may be made if T-value standards listed under Soil Production 2500 are met and other resource objectives are not jeopardized.

Include in the filter strip only the area to the break of the slope when the slope adjacent to the watercourse is shorter than the filter strip width shown below. Disregard benches less than 50 feet in width within the filter strip.

The minimum filter strip (the initial 100 feet of larger filter strips) complement buffer zones recognized by standards and guidelines for specialized habitats.

Width of Filter Strip by Percent Slope for Each Side of Stream to be Protected

| | Percent Slope | | | | | | |
|---------------|--------------------------|-----|-----|-----|-----|-----|-----|
| | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
| | Filter Strip Width, Feet | | | | | | |
| Perennial: | 100 | 100 | 130 | 170 | 210 | 250 | 290 |
| Intermittent: | 100 | 100 | 130 | 170 | 210 | 250 | 290 |

Fertilizer applications shall not exceed the soil's nutrient retention capacity. (Fertilizer applications are not applicable to Management Prescriptions 5.1 or 9.1). (*NPSMP Goals/Objectives/Strategies B.*)

Riparian area management will emphasize their protection and improvement as specialized wildlife habitat and the enhancement of their visual quality to complement recreational use. Reference Forest-wide Standards and Guidelines 2300 – Rivers and 2600 – Riparian Specialized Habitat.

Limit heavy equipment use in filter strips and stream sides to the dry season or when the ground is frozen. Reference Forest-wide Standards and Guidelines 2400 and 2600 for additional filter strip and riparian zone requirements.

Dredge and fill activities shall comply with Corps of Engineer permit requirements.

All activities of the Forest Service and its permittees shall comply with provisions of Executive Order 11988 (Floodplain Management) and 11990 (Wetland Protection). The Mark Twain National Forest Terrestrial Ecological Classification Inventory identifies floodplain ELT's. [not in Acronym List](#)

The following additional guidelines shall be applied to all facilities, structures, and other major investments in floodplains:

Floodplain location shall be avoided to the extent possible and practical. (*NPSMP Goals/Objectives/Strategies B.*)

Where floodplain avoidance is impossible or impractical, investment costs will be kept to the minimum necessary to accomplish the basic objectives so that financial losses and repair or replacement costs in event of flooding are minimized.

Developed recreation areas on the floodplain will be designed, constructed, operated, maintained, and repaired in the following manner:

Floodplains will be developed only in response to identified public recreation or resource protection needs.

Recreational development will be the minimum which satisfies the ROS classification and development scale and/or resource protection needs.

The most frequently flooded portion of the floodplain will be avoided to the extent practical.

Floodplain facilities will be inexpensive to replace or sufficient to physically resist or otherwise avoid damage by floodwaters, whichever offers the best resource protection at the least cost in the long run.

The Mark Twain National Forest Aquatic Ecological Classification inventory identifies wetlands (palustrine aquatic type associations).

Wetlands will have a minimum of a 100-foot wide peripheral zone within which any management prescription will be modified on a case-by-case basis to: (Not applicable to Management Prescription 5.1)

Maintain and improve wetland values. (*NPSMP Goals/Objectives/Strategies B.*)

Comply with the riparian area management standards and guidelines including those identified for wildlife species with specialized habitat (standards and guidelines 2600).

Comply with river corridor management (standards and guidelines 2300).

Comply with Executive Order 11990 for wetland management.

Protect the visual resource.

Protect and enhance natural plant and animal communities.

Soil Productivity

Maintain soil productivity and enhance through natural processes.

Control accelerated erosion. (*NPSMP Goals/Objectives/Strategies B.*)

The Mark Twain National Forest Terrestrial Ecological Classification System Report and its interpretations will be used to evaluate soil management impacts relative to ecological landtypes when designing cultural practices.

All practices of the Forest Service, its permittees and cooperators shall use the following criteria in assessing adequacy of treatments in maintaining soil productivity.

No vegetative manipulation or utilization practices shall cause average annual soil loss to exceed Soil Conservation Service T-values. See ECS reports for exact T-value interpretations by ELT and soil series.

(A table of guidelines for T-values is supposed to be inserted here but was not reproduced. Contact Larry Furniss, Mark Twain National Forest, for additional information or a copy of the table.)

Vegetative manipulation and utilization practices which are applied at intervals shall not create conditions likely to cause soil loss during the first 12 months after disturbance in excess of the following on all soils except Gasconade and Ramsey soil series and the Granite Glades.

1.0 times the Soil Conservation Service T-values on sites with a low or medium natural soil improvement potential.

1.5 times the Soil Conservation Service T-value on sites with a high natural soil improvement potential.

On the Ramsey and Gasconade soil series and Granite Glades no vegetative manipulation or utilization practices shall create conditions likely to cause average annual on-site soil loss in excess of formation rate over the life of the practice.

Until the results of the cooperative research study on Gasconade soils can be incorporated in Forest Plan standards and guidelines, current practices will be applied.

Restoration objectives of highly disturbed areas, such as borrow pits, mined areas, and drill sites, will be determined on a case-by-case basis considering opportunity, economics, surrounding landscape, area objectives, and other pertinent factors.

Stream channelization on National Forest System lands by the Forest Service and others will only be done in emergency situations and only in the event that stream course stabilization is not practical. (*NPSMP Goals/Objectives/Strategies B.*)

Sedimentation of waterways shall be prevented or minimized where earth moving jobs such as road construction, drill site benching, or similar activity unavoidably bares sizeable areas of soil for extended periods of time. (*NPSMP Goals/Objectives/Strategies B.*)

